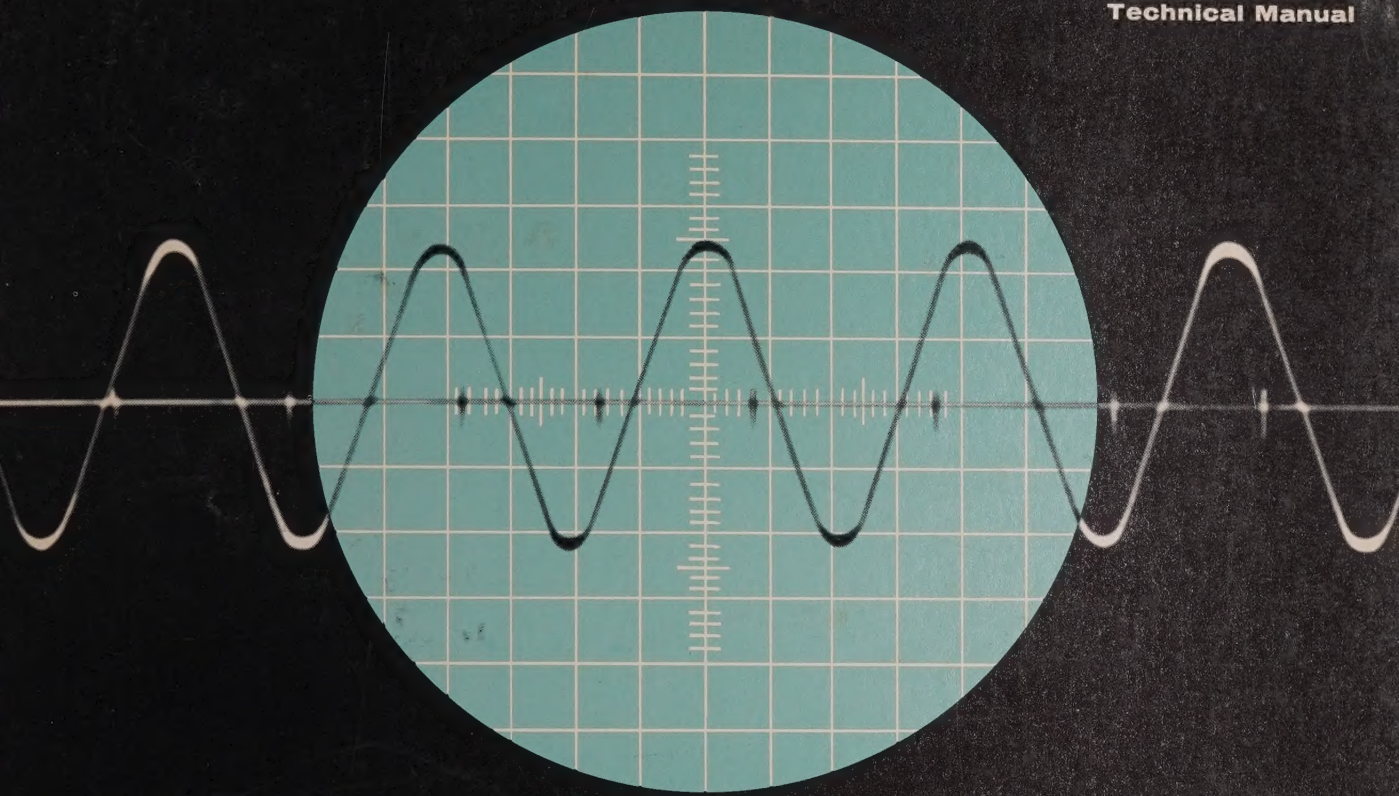
Technical Manual



WIDE BAND
SWEEP GENERATOR
MODEL 890

JERROLD
ELECTRONICS CORPORATION
INDUSTRIAL PRODUCTS DIVISION
PHILADELPHIA 32, PENNA.

JERROLD®

PRELIMINARY INSTRUCTION MANUAL
435-456

WIDE BAND
SWEEP GENERATOR
MODEL 890

JERROLD ELECTRONICS CORPORATION - INDUSTRIAL PRODUCTS DIVISION
BKE, OCTOBER 1964. PHILADELPHIA, PA., 19132

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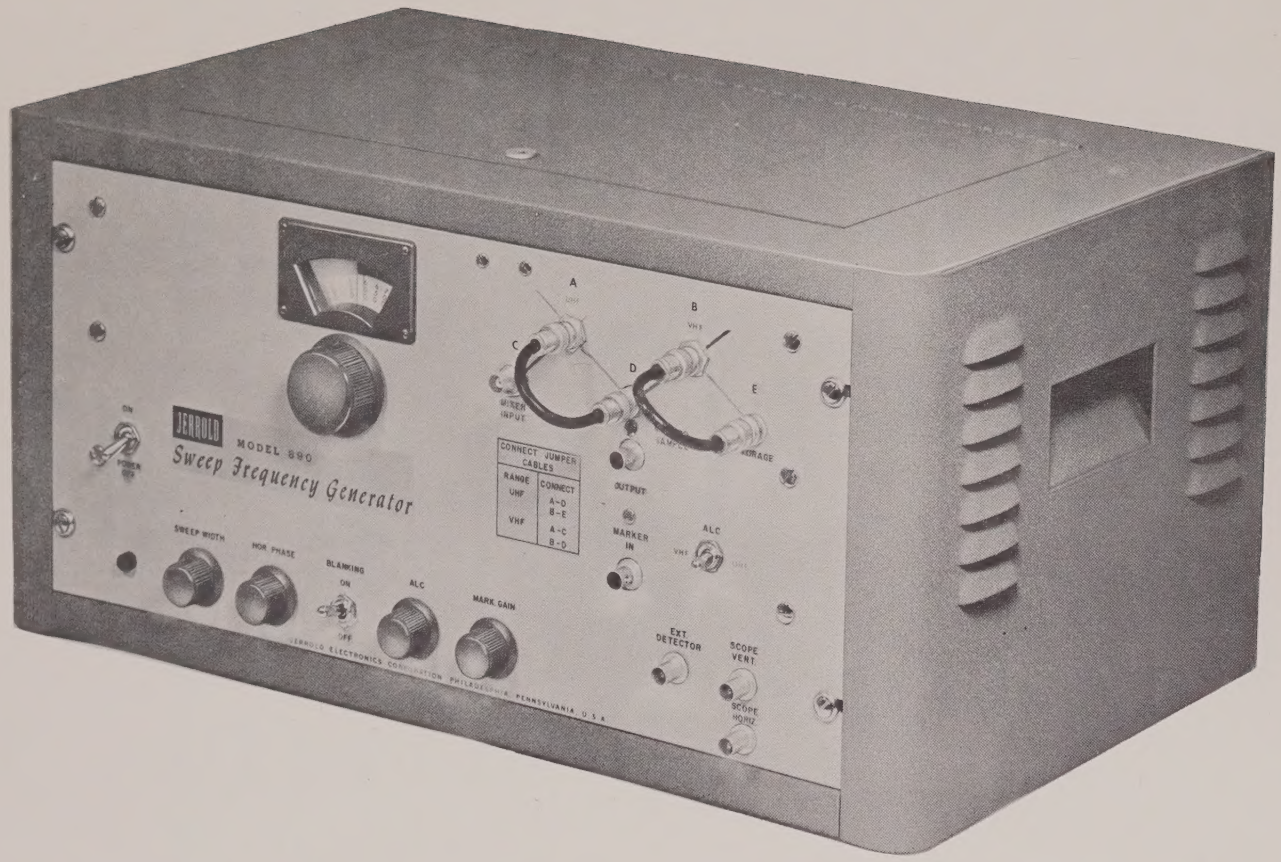
JERROLD
MODEL 890
Sweep Frequency Generator
ON
POWER
OFF
SWEEP WIDTH
HOR PHASE
BLANKING
ON
OFF
ALC
MARK GAIN
A
UHF
B
VHF
C
D
E
SWEEP INPUT
CONNECT JUMPER CABLES
RANGE
CONNECT
UHF
A-D
B-E
VHF
A-C
B-D
OUTPUT
MARKER IN
ALC
VHF
UHF
EXT DETECTOR
SCOPE VERT.
SCOPE HORIZ
JERROLD ELECTRONICS CORPORATION PHILADELPHIA PENNSYLVANIA U.S.A.

NOTES:
1. This manual will be superseded by a printed version as soon as available.
2. This manual is shipped with Model 890, Serial #
3. This manual incorporates all Engineering Changes up to and including E. C. O. 3182.
4. All data in this manual are subject to change without notice.

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SWEEP GENERATOR MODEL 890

INTRODUCTION

Model 890 is a wide-band sweep generator designed for highly economical laboratory and production line test set-ups permitting accurate, fast, and repetitive measurements.

The instrument features a wide sweep frequency range, highly variable sweep width, a flat response, and has a built-in marker amplifier and input circuit for an external marker generator.

The horizontal deflection circuit incorporates a phase adjusting control permitting adjustment of the scope pattern. The blanking circuit permits blanking the return trace.

A carefully designed filter network in the vhf circuit section prevents transmission of frequency components other than those desired. This insures that the voltage measured at the output by an untuned detector is a true indication of the sweep output.

The mechanical design is rugged; all parts of the sweep oscillator are machined from silver-plated brass stock, with the slider moving in a rhodium-plated tube. Shock mounts within the cabinet prevent transmission of external shock to the sweep mechanism, and mechanical hum from the unit onto the test bench. Removed from the cabinet, the instrument can easily be mounted on a 19" standard rack.

SPECIFICATIONS

FREQUENCY RANGE	VHF ... 500 kc to 450 mc UHF ... 275 mc to 1100 mc
SWEEP WIDTH	VHF ... Min. 100 kc; max. 200 mc UHF ... Min. 100 kc; max. ± 10% of center frequency
OUTPUT VOLTAGE	VHF ... 0.25 volts rms or more into 50 ohm load UHF ... 0.5 volts or more into 50 ohm load
OUTPUT VOLTAGE VARIATION (as viewed on oscilloscope, using Jerrold Model D-50UB Detector)	VHF ... ± 0.5 db, at max. sweep width UHF ... ± 0.5 db up to 800 mc; ± 1.5 db from 800 to 1100 mc; at max. sweep width. On narrower sweep widths, variations are less.
SPURIOUS BEATS AND HARMONICS	20 db or more below fundamental output
SOURCE IMPEDANCE	50 ohms nominal
LINEARITY OF FREQUENCY SCALE	Within 7% of sweep width (in relation to horizontal deflection voltage).
SWEEP REPETITION RATE	Line frequency, sinusoidal.
HORIZONTAL DEFLECTION VOLTAGE	At least 10 volts p-p, 60-cycle sinusoidal.
MARKER INPUT	20 mv or more; gain of marker amplifier is variable.
BLANKING	No blanking, or blanking of either forward or return trace; output reduced to zero.
POWER REQUIREMENTS	75 watts, 105 to 125 v rms, or 200 to 260 v rms, 60 cycles (50 cps units are available on special order).

CHART OF CONTROLS AND CONNECTIONS

FRONT PANEL

NAME AND POSITION	CIRCUIT DESIGNATION	TYPE	FUNCTION
POWER ON-OFF	S1	2-POSITION TOGGLE SWITCH	Energizes and de-energizes the unit.
SWEEP WIDTH	R46	POTENTIOMETER	Controls width of sweep range selected by jumpers on front panel.
(Frequency in) (megacycles)	--	CALIBRATED DIAL	Indicates center frequency of swept range; calibrated from 0 to 450 and from 275 to 1000 mc for the vhf and uhf range respectively.
HORIZONTAL PHASE	R52	POTENTIOMETER	Adjusts horizontal deflection voltage passed to oscilloscope.
BLANKING ON OFF	S2	2-POSITION TOGGLE SWITCH	Blanks return trace on scope. No blanking of return trace.
ALC	R32	POTENTIOMETER	Applies ALC and controls r.f. output level.
MARKER GAIN	R10	POTENTIOMETER	Controls marker amplitude.
ALC VHF-UHF	S3	2-POSITION TOGGLE SWITCH	Selects either vhf or uhf frequency range in which the ALC circuit is desired to operate.
EXT DETECTOR	J5	COAXIAL FITTING	For connection of jumper to remote detector.
MARKER IN	J9	COAXIAL FITTING	For connection of jumper to marker generator.
SCOPE VERTICAL	J6	COAXIAL FITTING	For connection of jumper to vertical input of oscilloscope.
SCOPE HORIZONTAL	J10	COAXIAL FITTING	For connection of jumper to horizontal input of oscilloscope.

NAME AND POSITION	CIRCUIT DESIGNATION	TYPE	FUNCTION
OUTPUT	J8	COAXIAL FITTING	For connection of rf output to circuit under test.
A UHF	J4	COAXIAL FITTING WITH JUMPER CABLE ATTACHED	Connect to C MIXER INPUT for sweeping in vhf range; connect to D MARKER SAMPLE for sweeping in uhf range.
B VHF	J1	COAXIAL FITTING WITH JUMPER CABLE ATTACHED	Connect to D MARKER SAMPLE for sweeping in vhf range; connect to E STORAGE for sweeping in uhf range.
NOTE: Coaxial fitting E STORAGE has the sole function of accepting the connector on the vhf jumper when the latter is not used, i.e. when the unit sweeps in the uhf range. The fitting has no electrical connection and is not shown on the schematic.			
C MIXER INPUT	J3	COAXIAL FITTING	Jumper to A UHF for sweeping in the vhf range, not connected when sweeping in the uhf range.
D MARKER SAMPLE	J7	COAXIAL FITTING	Jumpered to A UHF for sweeping in the uhf range; jumpered to B VHF when sweeping in the vhf range.
REAR APRON OF CHASSIS			
BLANKING PHASE	R38	POTENTIOMETER	Permits adjustment of blanking circuit to phase in properly with the sweep circuit.
FS1	FS1	FUSE	Line fuse, 117 vac, 1 amp, or 220 vac, 0.5 amp.

CIRCUIT DESCRIPTION

(compare DWG. E861-631)

1. UHF SWEEP OSCILLATOR

The uhf sweep oscillator constitutes the heart of Model 890.

The instrument's center frequency is determined by the inductance in the oscillator's tuned circuit. This inductance is formed by a section of air-dielectric coaxial line. The effective length, and hence the inductance of this line, is variable by a short-circuiting plunger the position of which is governed by the setting of the center-frequency tuning dial on the front panel.

The capacity across the coaxial line, and thus the oscillator frequency, is varied at a 60-cycle rate by a wobbulator capacitor driven by a precision voice coil mechanism. The oscillator tube V501 is a pencil triode employed in a grounded grid circuit with the plate connected to the high end of the resonant circuit. A disc capacitor grounds the grid for rf, while the cathode is floated above ground on uhf chokes which provide a high-impedance path from cathode to ground over the entire frequency range of the oscillator. Sufficient feedback coupling is achieved by a small capacitor between cathode and plate, with the latter grounded for dc.

The negative supply voltage for the cathode is supplied through tube V6 in the automatic level control circuit stage. Varying the grid voltage on V6 varies the oscillator dc current and thus provides automatic level control of the oscillator output.

2. UHF CIRCUITS

A probe, capacitively coupled to the plate of V501, couples energy to the UHF-ALC detector constituted by CR601, CR602 and associated components. The detector rectifies the uhf voltage and thus provides a dc input to the ALC amplifier proportional to the uhf level.

The ALC action keeps the sweep oscillator oscillating at a constant level as it sweeps over a band of frequencies; thus the uhf voltage picked up by the output probes is held effectively constant. The rf output probe is brought out to connector J4, labelled A UHF on the front panel.

3. VHF CIRCUITS

For operation in the vhf range, the unit is required to act as a beat frequency oscillator. For that purpose the vhf circuitry has been designed to include a 600 mc fixed oscillator the output of which is combined with that of the sweep oscillator in a crystal diode mixer. The difference frequency which varies from 500 kc at the low end, where the two oscillators lock in, to 450 mc at the high end, where the sweep oscillator already operates at the uhf upper limit of 1050 mc, is filtered out and passed to the output.

The fixed oscillator employs a pencil triode V101 in a grounded-grid circuit. Its output is coupled through a capacitive probe and a short length of coaxial line to one input of the mixer. The mixer itself consists of a triple filter network, the mixer diodes CR401 and CR402 and the vhf detector employing diodes CR403 and CR404. The beat output from the mixer diodes is fed through a low-pass filter which cuts off at about 500 mc. At the output end a choke L406 provides a dc return for the diodes and protects them against dc or low-frequency ac hazards which might be introduced via the output fitting.

The VHF ALC detector monitors the voltage at this point and, with the ALC amplifier, acts to hold the voltage constant.

4. ALC AMPLIFIER

The ALC amplifier is a high-gain, two-stage, direct coupled amplifier. Two pentodes V3 and V4 are employed in the first stage, two beam power tubes V5 and V6 in the second. A balanced circuit is used to minimize effects of supply voltage variations. A voltage regulator V7 in the power supply stabilizes the voltages applied to the amplifier.

Automatic level control is achieved by an inverse feedback circuit amplifying the dc output of the ALC detector and applying it with reversed phase to the sweep oscillator. As the detector output increases, the oscillator output decreases. To keep variations in the detector output to a minimum, the ALC amplifier is required to have a high gain. In addition, flat output also requires suppression of harmonics and spurious beats in the rf output both in the uhf and vhf condition. This is achieved by careful placement and shielding of probes for the uhf condition and by careful adjustment of drive levels and bias on the mixer diodes for the vhf condition.

5. WOBBULATOR DRIVE AND HORIZONTAL DEFLECTION CIRCUIT

Variation of the sweep oscillator frequencies is achieved by capacitor plates, variable by a voice-coil driven loudspeaker mechanism on which the plates are mounted. Varying the drive voltage on the voice coil varies the amplitude of motion, hence the capacitance of the plates and thus the oscillator frequencies over a very wide range (over 2000:1). A 5K-ohm potentiometer R46 followed by step-down transformer T2 insure smooth control with low drive impedance.

To obtain a pure sine-wave voltage for horizontal deflection, a portion of the 60 cycle line voltage is applied to the primary of resonant transformer T3 which is tuned to the drive frequency by two capacitors C16 and C17. A wide-range phase shifter employing potentiometer R52 and C15 across the secondary of T3 permits matching forward and return traces on the oscilloscope.

6. BLANKING CIRCUITS

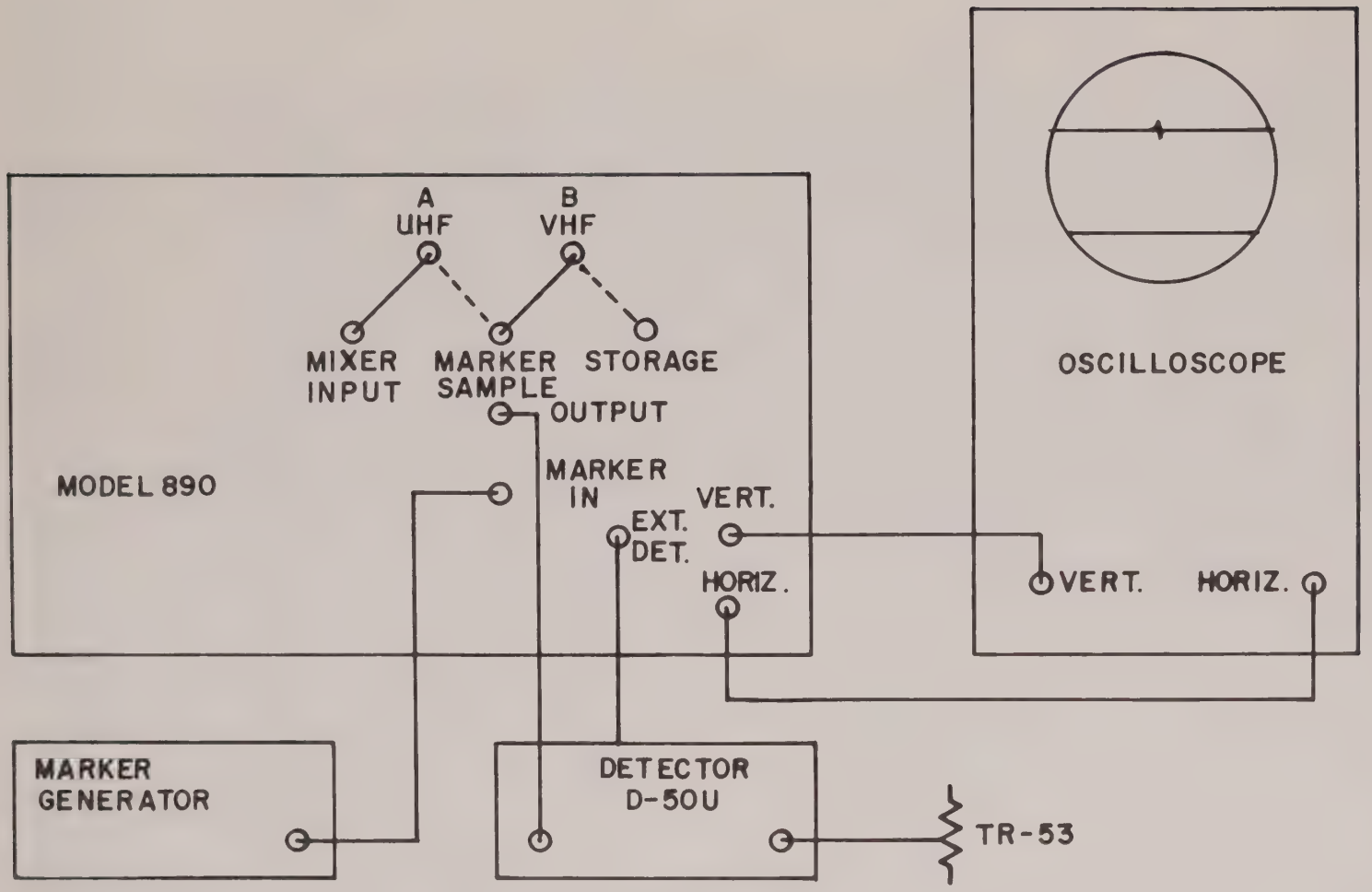
Blanking of the return trace is accomplished by applying the horizontal deflection voltage through an isolating rc network to a cathode-coupled driven multivibrator V2. The constants of the multivibrator are chosen to produce a properly-phased 60-cycle square wave. Potentiometer R38 permits adjustments over a small range of phase variations. The multivibrator output is applied to the grid of V3 in the ALC amplifier with CR4 acting as clamping diode to keep the voltage at this point constant during the forward trace.

7. MARKER AMPLIFIER

An input for a marker signal from an external marker generator is provided on the front panel to permit frequency calibration of the response curves obtained with Model 890. The input is applied on one side to the marker mixer diode CR301; on the other side it is loosely coupled to the sweep output. As the frequency of the sweep passes the frequency of the marker generator signal, a beat is produced in the output of the diode, sweeping from a few hundred kc down to zero beat and back up again. These beat signals are amplified in the two-stage amplifier V1 with a response showing a resonant peak at about 50 kc. Potentiometer R10 serves as gain control for this circuit, governing the height of the marker pips on the oscilloscope.

8. POWER SUPPLY

The built-in power supply uses a straightforward full-wave silicon diode rectifier CR1 and CR2 with choke/capacitor filtering and a voltage stabilizer tube V7. For best high-frequency operation, the sweep oscillator plate is connected to chassis ground, with the positive terminal of the power supply grounded and all circuits operating below ground potential.



BLOCK DIAGRAM - MODEL 890 IN TEST SET-UP FOR OPERATIONAL CHECK.

INITIAL EQUIPMENT SET-UP AND CHECK OF OPERATION
(compare block diagram)

A. EQUIPMENT REQUIRED:
- 1 Model 890
- 1 Oscilloscope, Hewlett-Packard #130A or equivalent
- 1 Detector, Jerrold Model D-50U, or equivalent
- 1 Marker or Signal Generator
- 1 Terminating Resistor Jerrold Model TR-53 (shipped with Model D-50U)

Interconnecting cables equipped with BNC connectors.

B. SET-UP FOR VHF OPERATION

1. Energize Model 890, Oscilloscope and Marker Generator; allow 30 minutes warm-up time.
2. Connect SCOPE HORIZONTAL on Model 890 to horizontal input on oscilloscope; connect SCOPE VERTICAL to vertical input at oscilloscope; set oscilloscope sensitivity to approx. 0.2 volts/cm.
3. Connect detector outputs at rear of Model D-50U (+ or - depending upon polarity of presentation desired) to EXT DETECTOR on Model 890 front panel; connect one of the two fittings on the front of the D-50U to OUTPUT on Model 890 front panel; terminate the other fitting on the D-50U with the TR-53. *
4. Jumper A fitting to C fitting on Model 890 front panel; jumper B fitting to D fitting on Model 890 front panel.
5. Set ALC switch on Model 890 to VHF position.
6. Set center frequency dial to approx. 100 mc.
7. Set SWEEP WIDTH control to maximum (clockwise).
8. Set BLANKING switch to OFF position.
9. Set ALC control to maximum position (clockwise).
10. Set MARKER GAIN control to minimum position (counter clockwise).
11. The trace visible on the scope should now be adjusted by the HORIZONTAL PHASE control on Model 890 front panel until forward and return trace approximately coincide.
12. Backing off the ALC control on Model 890 should flatten the response on the scope; any further backing off should present itself on the scope as a reduction in ALC level (lowering of trace). Now re-adjust center-frequency tuning so that zero beat of the trace is positioned at left end of scale.
13. Setting BLANKING switch to ON position should prove that blanking of return trace had been effected.
14. Set marker generator to a frequency between 500 kc and 200 mc; clockwise turning of MARKER GAIN control on Model 890 should produce a pip on the scope trace indicating exact location of marker generator frequency.

*The detector housing should be grounded to the Model 890 chassis or housing, to prevent ac hum pick-up. A tapped 4-40 hole is provided on the rear of Model D-50U below the 2 output spigots, for attaching a ground lead with a screw. Where the Model G. R. #274-MB is used with the D-50U detector, ground one side of the plug.

15. Whenever SWEEP WIDTH control is to be adjusted, the BLANKING switch should be in OFF position and HORIZONTAL PHASE control should be re-adjusted.

C. SET-UP FOR UHF OPERATION

1. Jumper B fitting to E fitting; jumper A fitting to D fitting.
2. Set oscilloscope sensitivity to 1.0 volt/cm.
3. Set ALC switch on Model 890 front panel to UHF position.
4. Tune center frequency dial to approx. 500 mc.
5. Set SWEEP WIDTH control to maximum (fully clockwise).
6. Set BLANKING switch to OFF position.
7. Adjust HORIZONTAL PHASE control.
8. Set ALC control to produce a flat response on the oscilloscope.
9. Set MARKER GAIN control to minimum (fully counter-clockwise).
10. Return BLANKING switch to ON position.
11. Set marker generator to provide a frequency marker anywhere between 450 and 550 mc; clockwise turning of MARKER GAIN control on Model 890 should produce a pip on the scope trace indicating exact location of marker generator frequency.

NOTE: Backing off the ALC control (counter-clockwise) reduces the r.f. output and also reduces harmonic contents and spurious beats. Where high attenuation is desired, an attenuator should be inserted between OUTPUT fitting on Model 890 and detector.

EQUIPMENT MAINTENANCE

GENERAL It is recommended that half-yearly routine tests be made. The initial check-out procedure given in the previous chapter will equally serve to test the instrument's performance at the half-yearly routine inspection.

For pin-pointing component failures, a trouble-shooting chart is given here. The replacement parts list and schematic circuit diagram will facilitate component identification and location.

Separate sections deal with the replacement of the sweep oscillator tube V501, the fixed oscillator tube V101, and the various crystal diodes. Be sure that Model 890 is de-energized when making any one of these replacements!

TROUBLE SHOOTING CHART

A. LOW OUTPUT OR NO OUTPUT ON BOTH UHF AND VHF

CHECK:	REMEDY:
1. Fuse FS1	If blown, determine cause; repair or replace faulty part, then replace fuse.
2. Power supply voltages; if not present, check:	
a. Transformer windings; on T1;	If open or shorted, repair or replace T1.
b. Rectifiers CR1, CR2;	Replace bad rectifier; observe proper polarity!
c. Electrolytic capacitors C11, C12;	Replace bad capacitor; observe proper polarity!
d. Choke CH1 windings;	If open, replace choke.
e. Tube V7	Trial replacement is quickest way to check tube performance.
3. Wires connected to J2, P2. Connection on J2 and P2.	Determine cause, and repair.
4. Sweep oscillator tube V501.	For replacement procedure see next chapter.
5. UHF probe by connecting ohmmeter to front panel fitting A; reading should be 50 ohms to ground.	If no reading, or incorrect reading, replace probe. To reset probe coupling, remove fitting A from front panel and connect A to D-50U detector. Observing the response at the high frequency end of the uhf range (wide sweep width), back off the locknut on the probe, then slowly unscrew the probe and cable assembly. When the entire response falls off, stop! Then slowly screw probe assembly back in until a definite fall-off of highest frequency is observed. This will be a definite point on the scope trace; the object is to obtain maximum output without limiting the highest frequencies.

6.	Tubes V3, V4, V5, V6.	Replace faulty tube.
7.	Voltages on V3, V4, V5, V6.	If readings not within parameters, determine cause and repair or replace faulty component.
8.	Filter barrels FB4, FB5, FB6 in sweep oscillator stage for short or open circuit.	Replace defective filter barrel.

B. UHF OUTPUT BUT NO VHF OUTPUT

CHECK:		REMEDY:
1.	Fixed oscillator tube V101; voltages on V101; B+ current on V101 by inserting an ammeter between C111 on FB3 and wire leading to switch S3 (remove wire from tie point at FB3) - reading should be less than 20 ma, when tube is oscillating.	If necessary replace V101; if voltages not within parameters, determine cause and repair or replace faulty component; if B+ current reads 20 ma or more, replace V101.
2.	Mixer diodes CR401, CR402 with ohm meter for forward (100-200 ohms) and reverse (50-200 k ohms) resistance.	Replace faulty diodes; observe proper polarity!

C. NO ALC ACTION ON EITHER UHF OR VHF

CHECK:		REMEDY:
1.	As under para A 6 and 7.	As under para A 6 and 7.
2.	a. If u.h.f. output is absent, check detector diodes CR601 and CR602 with ohmmeter for forward (100-200 ohms) and reverse (50-200 k ohms) resistance.	Replace faulty diodes; observe proper polarity!
	b. If v.h.f. output is absent, check detector diodes CR403 and CR404 with ohmmeter for forward (100-200 ohms) and reverse (50-200 k ohms) resistance.	Replace faulty diodes; observe proper polarity!

D. ALC FUNCTIONS BUT DOES NOT FLATTEN RESPONSE ON VHF, OR RESPONSE IS GENERALLY FLAT BUT RISES SHARPLY AT ZERO BEAT ON VHF RANGE

CHECK:	REMEDY:
ALC Detector diodes CR403 and VR404 for forward (100-200 ohms) and reverse (50-200 k ohms) resistance.	Replace faulty diodes; observe proper polarity! NOTE: Be sure your external test equipment is set up properly! Check by connecting a 50-ohm patch cord between RF output and D-50U detector input with D-50U properly terminated. If response flattens, the trouble is in the test set-up.

E. INSUFFICIENT SWEEP WIDTH

CHECK:	REMEDY:
1. Warm-up time.	Allow minimum of 30 minutes.
2. Setting of SWEEPWIDTH control.	Reset for proper sweepwidth.
3. Wobbulator motor.	If defective, return instrument to Service Dept. at factory for replacement of motor.

F. SWEEPWIDTH CONTROL ACTS RUBBERY AT MAX. WIDTH POSITION.

If condition becomes really disturbing and intolerable to the operator, return the instrument to Service Dept. at factory for replacement of wobbulator drive.

G. RESPONSE BREAKS UP ERRATICALLY, CHANGES WITH SWEEPWIDTH CONTROL SETTING.

CHECK:	REMEDY:
Wobbulator capacitor plates may rub against each other, or dirt particles may have entered in between the plates.	If dirt particles are the cause, a sharp tap with a light tool on the cabinet may dislodge the particles and clear up the trouble; if not, return the instrument to Service Dept. at factory for repair.

H. NO SWEEP WHILE SWEEPWIDTH CONTROL IS VARIED

CHECK:	REMEDY:
1. Wobbulator voice coil for open circuit	Replace wobbulator motor or return instrument to factory for motor replacement.
2. Wobbulator drive circuit components.	Replace defective component.
3. Transformer T-2 for open winding.	Repair or replace T-2.

I. CHANGING THE CENTER FREQUENCY BY TUNING KNOB ON FRONT PANEL PRODUCES ERRATIC RESPONSE, ESPECIALLY AT HIGHER UHF SETTINGS

CHECK:	REMEDY:
For intermittent contact on inner slider due to dirt or wear.	Return the instrument to Service Dept. at factory for repair.

J. NO BLANKING

CHECK:	REMEDY:
1. Blanking tube V2	Replace defective tube.
2. Voltages on V2	If not within parameters, locate and replace defective component.
3. Blanking switch S2	Replace defective switch.

K. NO MARKERS ON TRACE (although external marker generator functions properly)

CHECK:	REMEDY:
1. Jumpers on front panel for proper contact with fittings and for continuity; cable from marker generator for proper contact and continuity.	See chart of controls for proper connections; repair or replace defective jumper or fitting.
2. MARKER GAIN control setting.	Set at maximum (clockwise) and then adjust.
3. Marker amplifier tube V1.	Replace tube.
4. Marker mixer diode CR301 for forward (100-200 ohms) and reverse (50-200 k ohm) resistance; use VTVM.	If defective, replace diode; observe proper polarity!
5. Voltages on tube V1	Determine faulty component and replace.

REPLACEMENT OF VARIABLE SWEEP OSC. TUBE V501

1. Ascertain that the equipment is de-energized; then remove chassis from cabinet.

2. Remove four screws from sheet metal end cover of Sweep Osc. housing and take off cover.

3. Unsolder leads from filament wires of tube using a small soldering iron. Notice that one filament wire is directly connected to the cathode sleeve. Swing the bifilar coil toward the opening and fold back out of the way.

4. Unsolder the four-turn coil from the cathode sleeve and fold the coil and resistor towards the opening of the box and out of the way.

5. Examine the three teflon-insulated shoulder washers that hold the grid flange of the tube in place. Loosen the screws slightly and turn the teflon washers until the flat portion is in a position to allow the grid flange of the tube to pass.

6. It will be noticed that a fourth screw and washer is positioned on the flange; do not remove or loosen!

7. Gently withdraw the tube straight out by grasping the cathode sleeve with two fingers.

8. At this point, an examination will reveal a spring contact cylinder inside the center rod. Before a new tube is inserted, it is important to push this contact cylinder in with the finger to make sure it is properly seated. Failure to do this will prevent the new tube from going in fully and might result in tube breakage during insertion.

9. When looking into the cavity, the open part of the spring contact cylinder should be at a 9 o'clock position.

10. The new Jerrold modified 5675 replacement tube is furnished complete with cathode sleeve and feed-back tab attached. It should be gently inserted plate-end first into the spring finger contact, being careful that the feed-back tab is positioned so as to feed into the opening of the spring contacts. It should be pushed in gently and straight until it is firmly seated. If the grid flange of the tube does not sit flush on the metal ring, it usually indicates that the spring contact cylinder was not pushed in far enough before the tube was inserted.

11. After the tube is inserted; the teflon insulator washers should be turned to lock the grid flange and the screws tightened gently. It must be emphasized that the entire operation is critical and any undue strain imposed on the tube at any time will break the tube at the metal-glass seals. As a rule, breakage usually occurs at the seal on the plate side of the grid disc and since this cannot be seen, it is a good idea to listen carefully at all times during assembly for a faint but distinct "crack".

12. Resolder wires from bifilar coil to tube, with white wire going to the filament wire and the colored wire going to the cathode sleeve.

13. At this point an operational check should be made at UHF. The top frequency at max. bandwidth should be about 1200 MC before the oscillator stops. If it does not go this high, an adjustment of the feed-back tab will be necessary. An insulated small diameter rod should be used to gently push the feed-back tab (inside the hole) towards the tube plate. Watching the Oscilloscope display will show immediately if any good is being done. Do not apply too much pressure, otherwise the tube may break. The intention is to position the feed-back tab (teflon insulated copper tab) somewhat closer to the plate of the tube, the plate-end being the end inside the cavity. The tab should be bent only as much as is necessary to obtain the top frequency specified and not more, as too much feed-back will cause other troubles.

14. Replace cover on Osc. housing.

15. Check the coupling of the r.f. output probe.

REPLACEMENT OF FIXED OSCILLATOR TUBE V101

1. Ascertain that the equipment is de-energized! Then remove the fixed oscillator compartment cover by removing its four screws. The tube will be seen mounted in horizontal position.

2. The plate end of the tube has a metal tip and the filament end has a socket. Grasp the tube at the plate and filament ends and carefully remove it from its mounting clips. Be careful not to displace the filament chokes as the tube comes free.

3. When the tube is free from its mounting clips, cautiously pull the filament socket from the tube.

4. Insert the filament pins of the new 5675 into the filament socket.

5. Insert the new tube into its mounting clips being very careful that the grid flange of the tube is lined up correctly with the grid clip before pushing the tube gently into place until it is firmly seated.

6. Replace cover being sure that the probe is over the plate of the tube.

7. After tube replacement, the alignment of the fixed oscillator circuit must be checked.

    a. Connect a milliammeter in series with the plate connection of V101 (underside of chassis).
    b. Turn the sweep generator on and adjust C103 and C102 (plate and cathode trimmers respectively) for minimum plate current. The tube should oscillate without drawing excessive current.
    c. To tune the fixed oscillator to the proper frequency set the sweep to VHF condition with SWEEP WIDTH control fully ccw; then insert an accurate marker of 600 mc and adjust the sweep to zero beat at this frequency.

REPLACEMENT OF CRYSTAL DIODES

A. GENERAL

This section deals with the replacement of the following crystal diodes: CR401, CR402 in the VHF MIXER stage,
CR403, CR404 in the VHF ALC DETECTOR circuit,
CR601, CR602 in the UHF ALC DETECTOR circuit.
In all cases of replacement, proper polarity must be observed; the black bar on the crystal diode indicates + (positive) side! Be sure that Model 890 is de-energized, to avoid shock hazard during replacement!

It is recommended that replacement always be made of pairs of diodes, and that before insertion of new diodes their forward and reverse resistance be measured and compared with the limits given in the trouble shooting chart. Use of diodes meeting these specifications will simplify retuning the circuit concerned, if such retuning is required.

Crystal diodes ordered from Jerrold also bear color-coding dots identifying the circuit stage in which the pair is used: blue dot for mixer diodes,
brown dot for vhf ALC diodes,
red dot for uhf ALC diodes.

B. REPLACEMENT OF CR401 AND CR402

1. Remove the 2 screws which attach the mixer housing to the front panel.
2. Disconnect the cables from the connectors on the mixer body; make a note of the color-coding of the connectors.
3. Lift the mixer body straight up from the chassis to disengage the banana plug at the bottom of the mixer body.
4. Do not unsolder the 2 wires from the vhf ALC crystal assembly; their length is sufficient to permit propping up the unit and obtaining access to the crystal diodes.
5. Remove the 4 screws from the small cover on the UHF mixer part; then remove the 3 screws holding the sub-assembly plate inside the housing (two screws hold down the insulator, the third is located between the fixed capacitors at the other end).
6. Lift the coupling loop from the connector up and out of the way.
7. Lift the sub-assembly plate enough to permit disengaging the diodes from their clips and maneuver the plate out of the housing.
8. Observing proper polarity, insert the new diodes in the dual clip in the mixer body first (not in the sub-assembly plate!)
9. Carefully replace the sub-assembly plate so that the clips properly engage the crystal diodes.
10. Re-insert the 2 screws fastening the insulator and the one between the fixed capacitors (removed in step 5).
11. Bend the coupling loop back toward the tuned circuit into its original position.

C. REPLACEMENT OF CR403 AND CR404.

1. These crystal diodes are located under the round plate on the VHF ALC MIXER housing; remove the 4 screws holding that plate and gently pry the plate off, using a knife or small screwdriver.
2. Remove the defective diodes and, observing proper polarity, insert the new diodes in the dual clip.
3. Replace the round plate and re-insert the 4 screws; insure that the r.f. weather-stripping is properly engaged in the machined groove.

NOTE: If difficulty is encountered in replacing the diodes, it is permissible to remove the 3 screws holding the large cover. Removing this cover will give the operator a better view of the mixer interior.

D. REPLACEMENT OF CR601 AND CR602

1. Disconnect the jumper coming from the sweep oscillator assembly.
2. Remove the 4 slotted hex head screws holding the UHF ALC DETECTOR to the chassis. Remove the 2 wires from the bottom of the UHF ALC detector; note polarity of wires! Then remove the detector from the chassis.
3. Remove the 8 slotted round head screws holding the circuit assembly in the detector housing.
4. With a slight side-to-side rocking motion draw the circuit assembly straight out of the detector housing to disengage the crystal diodes from their holders.
5. Remove the diodes and, observing proper polarity, insert the new ones in the dual clip; do not displace the filter barrels from their position as this may de-tune the circuit!
6. Re-insert the assembly into the detector housing and fasten with the 8 round head screws.
7. Re-mount the detector with the 4 hex head screws on the chassis and, observing proper polarity (see step 2), re-connect the 2 wires at the bottom of the detector.
8. Re-connect the jumper from the slider assembly.

NOTE: Equipment being returned to the factory for servicing must be properly packed and shipped, with all charges, including insurance, prepaid. A letter with a brief outline of difficulties encountered should accompany the equipment. This will speed up servicing and prompt return of the unit to the user.

REPLACEMENT PARTS LIST MODEL 890

ASSEMBLY REF. DWG. NO.: E861-631

ITEM	SCHEMATIC DESIGNATION	QTY	DESCRIPTION	JERROLD PART NO.
			CAPACITORS	
1	C1, 2, 5	3	150 pf, 10%, 600 v	123-107
2	C3, 4	2	0.02 uf, 600 v, ceramic disc	124-034
3	C6	1	300 pf, 5%, 500 v	126-022
4	C7	1	4000 pf, 600 v	125-006
5	C8	1	0.25 uf, 200 v	125-008
6	C9	1	0.01 uf, 400 v	125-013
7	C10	1	1000 pf	123-115
8	C11	1	30 uf, 350 v, electrolytic	127-504
9	C12	1	50 uf, 350 v, electrolytic	127-503
10	C13, 16, 17	3	0.1 uf, 400 v, (C16 & C17 are factory selected)	125-003
11	C15	1	0.047 uf, 400 v	125-001
			CHOKES	
12	CH1	1	10 h, 140 ma	143-102
13	CH2	1	30 mh, 100 ma	143-111
			CONNECTORS	
14	J2	1	Receptacle, 6 pin	182-114
15	J5, 6, 10, storage	4	Receptacle, BNC, UG 657/U	188-103
			DIODES	
16	CR1, 2	2	560 vac, 750 ma, 800 piv	137-711
17	CR3	1	280 vac, 750 ma, 400 piv (factory selected, when used)	137-712
18	CR4	1	1N34	139-100
			ELECTRON TUBES	
19	V1, 2	2	12AT7	131-400
20	V3, 4	2	6AU6	131-306
21	V5, 6	2	6V6	131-322
22	V7	1	OD3/VR-150	132-101
			FUSE	
23	FS1	1	3AG, 1 amp, Slo-Blo	101-344
			PILOT LIGHT	
24	DS1	1	Lamp, neon	102-514

REPLACEMENT PARTS LIST

ASSEMBLY REF. DWG. NO.: E861-631

ITEM	SCHEMATIC DESIGNATION	QTY	DESCRIPTION	JERROLD PART NO.
			RESISTORS	
25	R7, 33, 51	3	100 k, 10%, 1/2w	112-614
26	R8	1	270 k, 10%, 1/2w	112-668
27	R9, 11	2	2.2 k, 10%, 1/2w	112-404
28	R10, 52	2	0.5 meg., potentiometer	118-028
29	R15, 16	2	3.3 ohms, 5%, 1/2w	112-009
30	R17	1	7.5 k, 10%, 1/2w	113-012
31	R18, 23, 26, 28	4	100 ohms, 10%, 1/2w	112-236
32	R19, 24	2	150 k, 10%, 1/2w	112-635
33	R20	1	15 k, 10%, 2w	112-511
34	R21	1	2.5 k, 10%, 10w	113-010
35	R22	1	1 k, 10%, 1/2w	112-362
36	R25	1	75 k, 5%, 1/2w	112-599
37	R27	1	1.3 k, 5%, 1/2w	112-337
38	R29	1	500 ohm, potentiometer, S1 shaft & locknut	118-005
39	R30	1	620 ohm, 5%, 1/2w	112-335
40	R31	1	9.1 k, 5%, 1/2w	112-482
41	R32, 46	2	5 k, potentiometer	118-012
42	R34, 39	2	1 meg., 10%, 1/2w	112-740
43	R35	1	390 k, 10%, 1/2w	112-689
44	R36	1	430 k, 5%, 1/2w	112-692
45	R37	1	180 k, 5%, 1/2w	112-644
46	R38	1	0.5 meg., potentiometer, S1 shaft & locknut	118-030
47	R40	1	220 k, 10%, 1/2w	112-656
48	R41	1	1.5 meg., 10%, 1/2w	112-761
49	R42	1	820 ohm, 5%, 1/2w	112-350
50	R43	1	330 k, 10%, 1/2w	112-677
51	R44	1	10 k, 10%, 20 w, w.w.	113-019
52	R45	1	5 k, potentiometer, S1 shaft & lockwasher	118-023
53	R50	1	510 k, 10%, 1/2w (factory selected)	112-704
54	R54	1	1 ohm, 5%, 2w (factory selected, when used)	110-105
			SWITCHES	
55	S1, 2	2	Spst, toggle	162-001
56	S3	1	Dpdt, toggle	162-008

REPLACEMENT PARTS LIST

ASSEMBLY — REF. DWG. NO.: E861-631

ITEM	SCHEMATIC DESIGNATION	QTY	DESCRIPTION	JERROLD PART NO.
			TRANSFORMERS	
57	T1	1	Power, 115/230 v, 50/60 cps	141-154
58	T2	1	Filament, 115 v, 50/60 cps	141-116
59	T3	1	Audio	141-192
NOTE: Schematic designations C14, R1-6, 12-14, 47, 48, 49, 52, 53 are not used.				
			FIXED OSCILLATOR ASSEMBLY	
			CAPACITORS	
1	C101	1	1000 pf, 10%, 500 v, mica button	129-155
2	C102, 103	2	0.75 - 9.5 pf, trimmer	821-203
3	C104	1	Grid clip	224-016
4	C106-111	6	1000 pf, feed thru	129-200
			CONNECTOR	
5	J16	1	Receptacle, UG 657/U	188-103
			ELECTRON TUBE	
6	V101	1	5675	131-501
NOTE: Schematic designation C105 not used.				
			MARKER INSERTER ASSEMBLY	
			CAPACITORS	
1	C301	1	25 pf, 10%, 600 v, ceramic	123-101
2	C302	1	47 pf, 10%, feed thru	129-202
			CONNECTORS	
3	J7, 8, 9	3	Receptacle, BNC, UG657/U	188-102
			DIODE	
4	CR301	1	K3A	139-102

REPLACEMENT PARTS LIST

ASSEMBLY — REF. DWG. NO.: E861-631

ITEM	SCHEMATIC DESIGNATION	QTY	DESCRIPTION	JERROLD PART NO.
			RESISTORS	
5	R301	1	1 k, 10%, 1/2w	112-362
6	R302	1	100 k, 10%, 1/2w	112-614
7	R303, 304	2	33 ohm, 10%, 1/2w	112-173
8	R305	1	5.6 k, 10%, 1/2w	112-458
			MIXER ASSEMBLY	
			CAPACITORS	
1	C401, 402, 416	3	0.7-3 pf, trimmer	128-515
2	C403, 404, 405	3	Capacitor assembly	811-123
3	C406	1	1000 pf, 500 v, button	129-153
4	C407, 413	2	0.75 - 9.5 pf, trimmer	821-203
5	C408, 409	2	5400 pf, 500 v, button	129-150
6	C410, 411	2	0.25 uf, 200 v	125-008
7	C412	1	0.35 - 1.37 pf, trimmer	128-541
8	C414	1	1000 pf, feed thru	129-200
9	C415	1	47 pf, feed thru	129-202
			CONNECTORS	
10	J13, 14, 15	3	Receptacle, BNC, UG 657/U	188-103
			DIODES	
11	CR401, 402	2	K3A, w/o leads "blue"	139-107
12	CR403, 404	2	K3A, w/o leads "brown"	139-111
			RESISTORS	
13	R401	1	200 ohm, 5%, 1/2w	112-272
14	R403, 404	2	5.1 ohm, 5%, 1/2w	112-030
15	R405, 406	2	100 ohm, 5%, 1/2w	112-950
16	R407-408	2	300 ohm, 5%, 1/2w	112-293
17	R409	1	100 k, 10%, 1/2w	112-614

NOTE: Schematic designation R402 not used.

			SWEEP OSCILLATOR ASSEMBLY	
			CAPACITORS	
1	C501	1	Grid clip	811-305
2	C502-505, 507, 508	6	1000 pf, feed thru	129-200
3	C506	1	Feedback tab	215-118

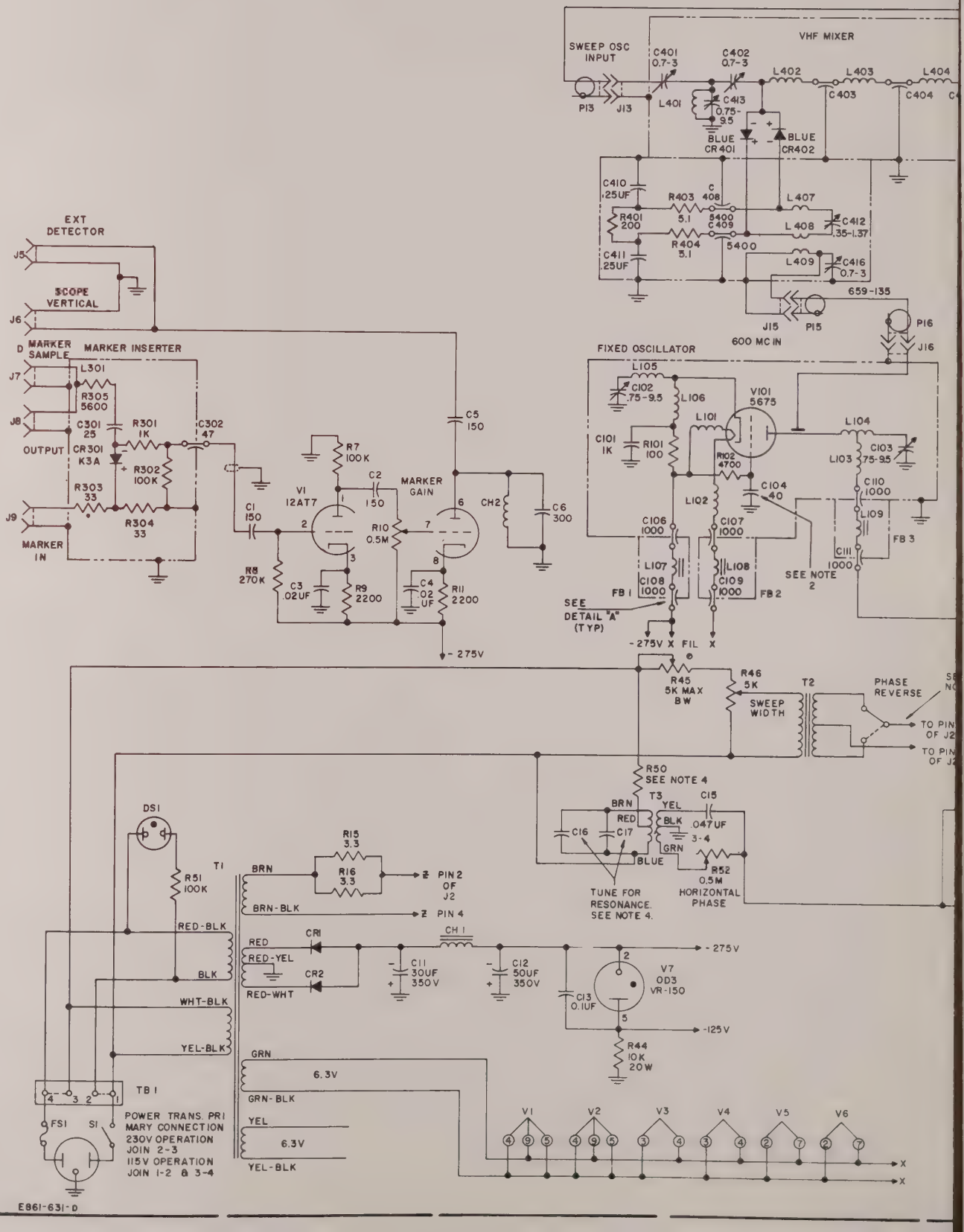
REPLACEMENT PARTS LIST

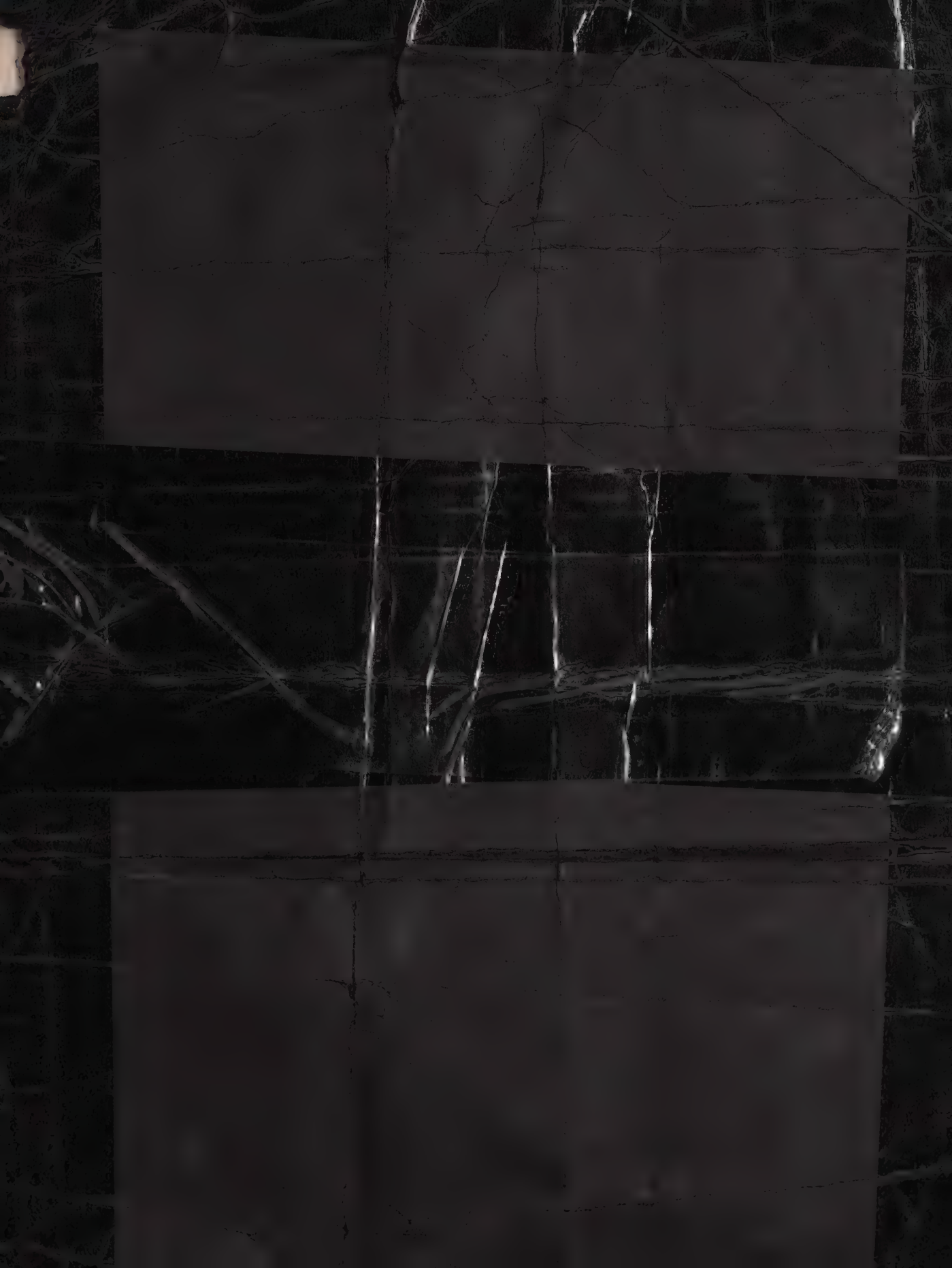
ASSEMBLY — REF. DWG. NO.: E861-631

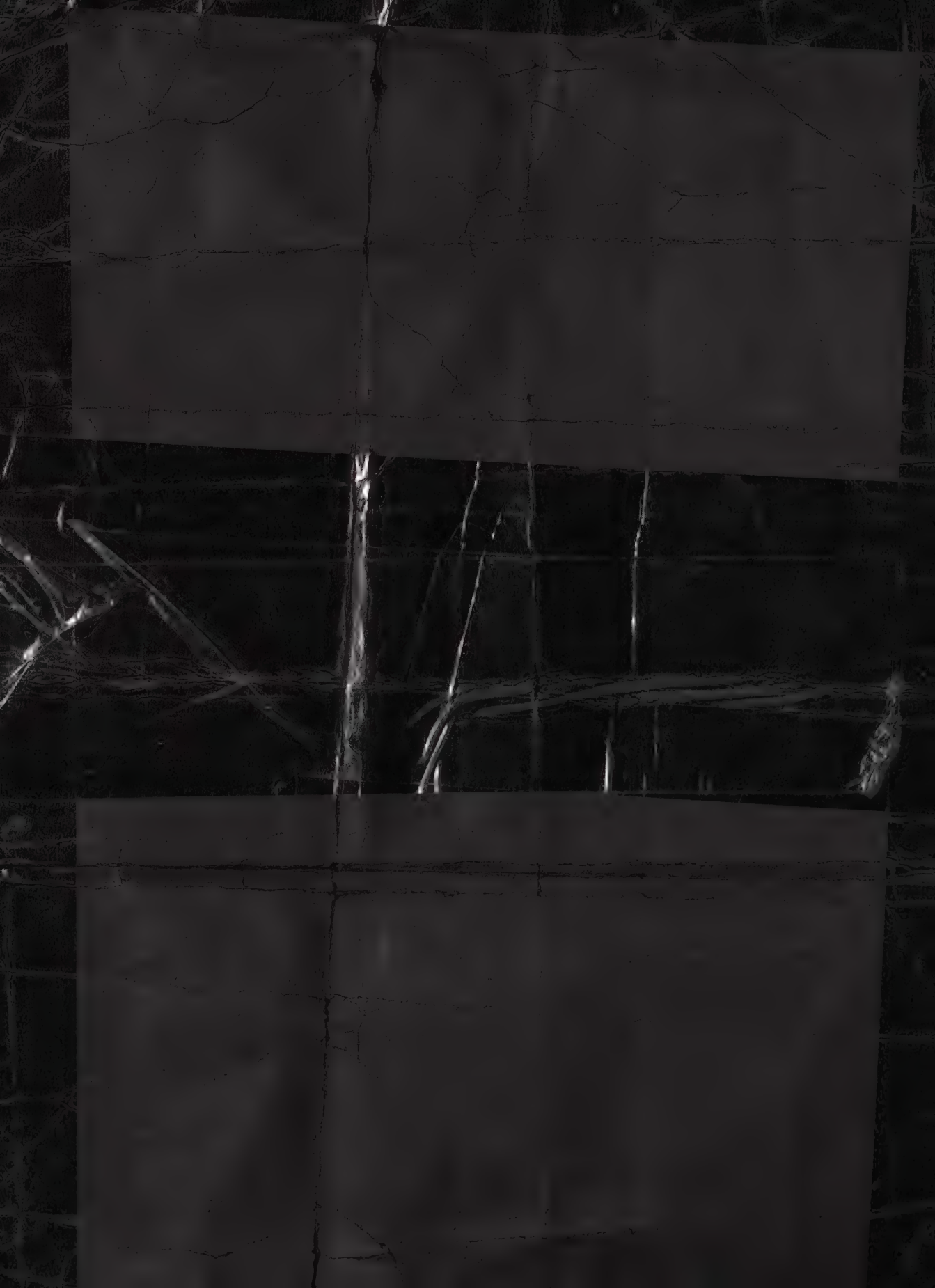
ITEM	SCHEMATIC DESIGNATION	QTY	DESCRIPTION	JERROLD PART NO.
			ELECTRON TUBE	
4	V501	1	5675 (modified)	815-107
			RESISTORS	
5	R502	1	4.7 k, 5%, 1/2w	112-443
6	R503-506	4	100 ohm, 5%, 1/4w	112-950
NOTE: Schematic designation R501 not used.				
			AGC DETECTOR ASSEMBLY	
			CAPACITORS	
1	C601	1	47 pf, feed thru	129-202
2	C602	1	1000 pf, feed thru	129-200
3	C603	1	1000 pf, 500 v, mica button	129-153
			CONNECTORS	
4	J21, 22	2	Receptacle, BNC, UG 657/U	188-103
			DIODES	
5	CR601, 602	2	K3A, w/o leads "red"	139-106
			RESISTORS	
6	R601, 603	2	300 ohm, 5%, 1/2w	112-293
7	R602	1	100 k, 10%, 1/2w	112-614
8	R604	1	Terminating resistor assembly, TR-53	821-142
			CABLE ASSEMBLIES	
1		2	Jumper cables	655-060
2		1	Jumper cable (J1-P14)	655-093
3		1	Jumper cable (J3-P13)	655-093-1
4		1	Jumper cable (P15-P16)	659-135
5		1	UHF probe	659-109
6		1	VHF probe	659-139

SCHEMA

SWEEP FREQUENCY G
MODEL 890







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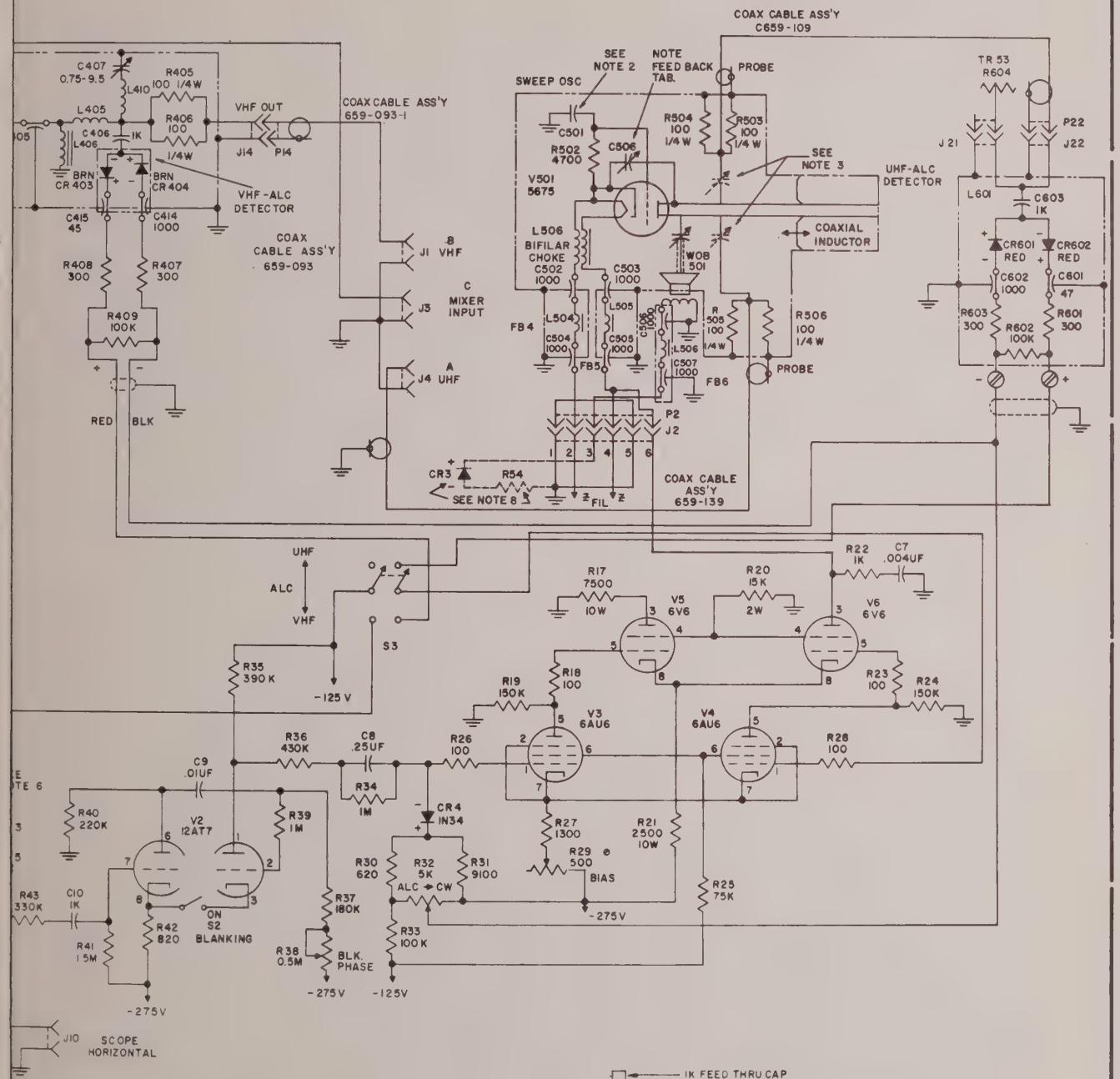
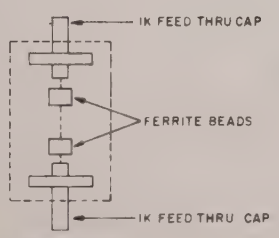




FB CONSTRUCTION ASS'Y NO. 823-018

DETAIL "A"

NOTES

1. UNLESS OTHERWISE SPECIFIED;
   A ALL CAPACITOR VALUES GIVEN ARE IN PF.
   B ALL RESISTORS IN OHMS, 1/2 WATT.
2. CAPACITANCE BETWEEN GRID OF V501 AND GROUND BUILT IN VIA GRID FLANGE AND INSULATORS.
3. THESE CAPACITANCES ARE DUE TO THE DISTANCES BETWEEN PROBE AND INDUCTANCE.
4. R50, C16 & C17 ARE FACTORY SELECTED.
5. WOBBULATOR CAPACITOR ASSEMBLY CONSISTING OF
   A. PLATE CAPACITOR SECTION.
   B. GRID CAPACITOR SECTION.
   C. WOBB. MOTOR CAPACITOR SECTION.
6. JUMPER MAY BE MOVED TO POSITION INDICATED BY DOTTED LINE TO REVERSE PHASE.

NOTES CONTINUED.

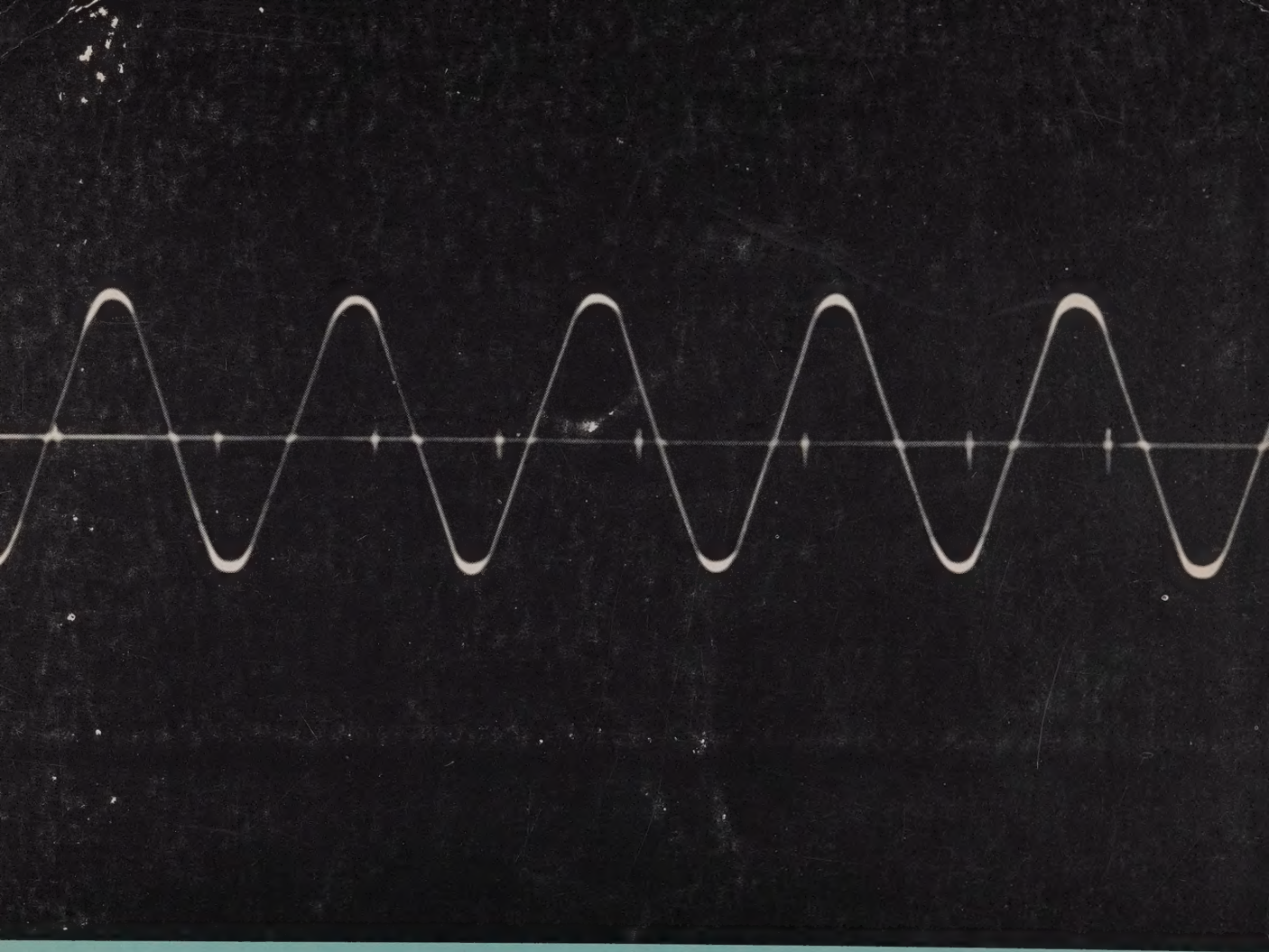
8. CR3 & R54 ARE FACTORY SELECTED WHEN NEEDED AND MAY NOT EXIST IN SOME UNITS.

WARRANTY

1. The Manufacturer warrants this test equipment, including all its component parts (except tubes, semi-conductors and relays), to be free from defects in material and workmanship under normal use and service, its obligations being limited to making good at its factory any part or parts so warranted which shall within one year after delivery by the Manufacturer be returned to it with transportation charges prepaid and which its examination shall disclose to its satisfaction to have been thus defective.

2. The benefit of this warranty shall not apply to any instrument or part thereof which shall have been repaired or altered outside of a repair unit, authorized or approved by the Manufacturer, in any way so as in the judgment of the Manufacturer to affect its stability and reliability, nor which has been subject to misuse, neglect, accident or improper application.

3. The Manufacturer disclaims any warranty other than as specifically set forth herein, and may discontinue models or alter their specifications without any obligation to incorporate any modifications in equipment previously sold.



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